

Building the Untethered Nation:

**A Strategic Guide for Communities on Wireless
Technology and Broadband Infrastructure**



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ABOUT THE GUIDE

Broadband landline and wireless networks have joined roads, ports and bridges on a short list of key public infrastructures that support commerce, education, recreation, and government in communities across the nation. Indeed, if the last decade was characterized by the build-out of high-speed fiber networks in the ground, then the decade ahead will be defined by extending those investments by bringing wireless connectivity to communities through the air using reliable, secure wireless technologies.

From rural communities, such as Walla Walla, WA, with a population of 59,000, to world-class cities, such as Philadelphia, Minneapolis, London and Stockholm and a growing number of cities in-between, such as Dayton, OH, Fresno, CA, or Tempe, AZ, local governments have assumed a leadership role in creating a connected, but wireless, future in the communities they serve.

In fact, Intel Corporation has collaborated with the researchers who compiled the national “Best Places” lists to compile the second annual list of “Most Unwired Cities” in America. It ranks the top 100 U.S. cities and regions with the greatest wireless Internet accessibility and reveals “an increasing number of hot spot locations across the country where people can use wireless-enabled notebook PCs to access wireless fidelity (Wi-Fi) without a traditional wired connection. Today, hot spots can be found in airports, public parks, college campuses, and hotels — as well as in diverse locations such as trucks stops, RV parks and malls.”¹

This guide explores the prospect for what the Center for Digital Government calls “the untethered nation,” and provides a primer for public officials and executives making decisions about the potential for wireless in their jurisdiction. The guide is organized into three parts:

Part One: The Basics, which provides an overview of wireless networks, devices and capabilities, and why and how local jurisdictions make a commitment to implement wireless;

Part Two: The Drivers, which discusses the key benefits, advantages and services that wireless provides both government and its citizens; and,

Part Three: The Decision Points, which describes the leadership and the key essentials to making wireless broadband networks successful.

The intention of this guide is to provide insight from leaders in those cities and counties that have successfully implemented a wireless network, are making progress toward building one, or those who are considering a similar move. These IT leaders have hands-on experience and knowledge to share with other local jurisdictions about the policy, business and technological challenges of a wireless build out, how to overcome them, and the impacts on government operations and their communities that come with successful implementations.

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¹ Intel Corp., Most Unwired Cities Survey, (<http://www.intel.com/personal/products/mobiletechnology/unwiredcities.htm>).

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

In an effort to deliver services through improved and effective utilizations to their citizens, public leaders are investigating whether wireless connectivity can bring economic savings by leveraging existing infrastructure, while improving network capabilities. And, with hot spots appearing at airports, hotels, coffee shops, universities, and even campgrounds, citizens are increasingly expecting access to wireless broadband technology.

This guide helps local government leaders understand:

- Wireless technology and implementation strategies available to them;
- Benefits of wireless technology; and,
- Decision points to help decide if wireless is right for their communities.

Along with defining wireless technology, this guide evaluates the benefits wireless technology can bring to the community. The return on investment (ROI) of a wireless broadband network goes beyond dollars invested in equipment to the qualitative benefits gained by field and mobile workers and access to government information and networks that was previously unavailable. While technology improvements and the value of wireless broadband are increasing daily, the threat of security breaches, on the other hand, is diminishing. Benefits of wireless broadband technology are seen in:

- **Increased Productivity from Mobile Government Workers:** Employees can work away from a traditional office to reduce overhead associated with desks, wires and other hardware.
- **Instant Uploading and Downloading of Information:** Enabling field workers to upload and download information and forms on the fly can improve productivity and create new efficiencies.
- **Enhanced Customer Service:** By reducing the amount of time it takes to input, upload and download materials (e.g., areas like social services, health services, inspectors, assessors, etc.), customer service can be improved.
- **Improved Accuracy:** Because information is entered at the point of collection, eliminating errors by reading paperwork and keying it into the computer back in the office, accuracy often is improved.
- **Reduced Paperwork:** Wireless broadband allows workers to input information electronically, eliminating note writing and printing of forms.
- **Increased Communication and Instant Access:** Employees can use wireless devices such as a BlackBerry® or a smartphone to send and receive e-mail, read calendars, conduct research on the Internet, and more, improving communication and increasing efficiency.

Perceived security threats are diminishing with improvements in technology. This guide reviews the perceived threats and discusses some of the new technologies including a hybrid encryption standard, called over-the-air encryption, available today.

Finally, after reviewing the technology and value of wireless broadband, this guide provides leaders with a roadmap to help them decide whether to move forward or not. Public leaders need to ensure the project will be worthwhile, valuable and cost-effective and efficient. The major decisions to focus on include:

- **Decision Point One: Who?** What kind of leaders from other areas of local government should be recruited? Who else is needed as part of the planning process to use wireless to further break down the operational silos in government agencies? What kind of characteristics should they possess that would help with major issues, such as mobilization, implementation, change management, and evaluation?
- **Decision Point Two: What?** What kind of wireless broadband technologies should be used? What are the considerations about security and data exchanges? What should be done to integrate wireless into enterprise architecture, with particular attention to network and computer security design? What kind of physical and logical access controls need to be established? Are there any public disclosure and compliance requirements?
- **Decision Point Three: Where?** How far should the wireless network stretch – should it include business districts? Campuses? Public places? Suburban and rural communities?
- **Decision Point Four: When?** Considering community readiness and anticipating WiMAX (see Key Definitions, p.6) standardization (which could provide high-speed wireless access in a 17 KM or 30-mile radius and beyond), how prepared does the local government and the community need to be?
- **Decision Point Five: How?** Build or buy? Should government own its wireless infrastructure or be its anchor tenant?

Looking under the hood at the technology and capabilities provided today, this guide provides government leaders with a brief look at wireless technology and guides leaders through two implementation tactics, the incremental approach and the “enterprise-at-once” approach, to help leaders figure out the best solution for their communities.

Part I: The Basics

Overview of Why and How Governments Harness Wireless Technologies

KEY DEFINITIONS



Anchor Tenant: An anchor tenant is an influential organization in a network that owns the resources and “leases” network access to “tenants.” In the case of local government, tenants would be other city departments and organizations, not-for-profits, community groups, businesses, educational institutions, and others.

Digital Subscriber Line (DSL): Digital telecommunications protocols that allow high-speed data communication over the Internet.

Hot Spots: Wireless access points that are found in public places such as airports, convention centers, hotels, and coffee shops.

Meshed Technologies: In a mesh network, PCs, PDAs and wireless devices communicate with each other rather than relay through an antenna and base station.

Reverse 9-1-1: Resident’s phone numbers could be stored in a confidential database, and in the event of an emergency, a police department would be able to send a telephone or cellular message to alert citizens of the situation and provide any necessary warnings or evacuation information.

Terrestrial Trunked Radio: Terrestrial Trunked Radio is an open digital trunked radio standard defined by the European Telecommunications Standardization Institute (ETSI) to meet the needs of the most demanding professional mobile radio users.²

Virtual Private Network (VPN): A network that is constructed by using public wires to connect nodes. For example, there are a number of systems that enable you to create networks using the Internet as the medium

for transporting data. These systems use encryption and other security mechanisms to ensure that only authorized users can access the network and that the data cannot be intercepted.³

Wireless: A term used to describe telecommunications in which electromagnetic waves, rather than some form of wire, carry the signal over part or all of the communication path.⁴

Wireless Broadband Technologies (also known as WiMAX or WirelessMAN):

The Air Interface Standard, Institute of Electrical and Electronics Engineers (IEEE) 802.16™ is a specification for fixed broadband wireless metropolitan access networks that use a point-to-multipoint architecture⁵ that supports high-speed, wireless networking across the nearby geographical areas.

Wireless Fidelity (Wi-Fi): Typically a land-line Internet access (DSL or faster) is connected to a Wi-Fi transmitter that enables any device equipped with a Wi-Fi transceiver to send and receive data at broadband speeds. The working distance for most Wi-Fi devices is 300 feet. Beyond 300 feet the throughput of the connection speed decreases.⁶

Wireless Local Area Networks: A local area network that uses high-frequency radio signals to transmit and receive data over distances of a few hundred feet; uses Ethernet protocol.⁷

Why Wireless?

Wireless devices have become commonplace in the way we work, learn and play. Today, citizens log onto wireless networks from cafes to campgrounds; students stroll from dorms to buildings on wireless campuses and have seamless access to the network (Indiana University’s and Iowa State University’s programs being among the better known); and private-sector employees use wireless access in their daily work.

Forrester Research forecasts that 51 percent of medium businesses will add wireless networking capabilities in 2005. Customer feedback gathered by Cisco and IBM indicate that medium-sized businesses want help in the design and implementation of a secure wireless network.⁸

With growing demand and increasing use, local governments are on the frontline of service delivery to citizens and are among the first to recognize the value of deploying wireless broadband technologies (Key Definitions of this and related technologies are provided in the sidebar). Already, many cities have embraced wireless broadband as a key strategy to providing efficient and effective services and support to a community that is safe, competitive in attracting and maintaining business investments, and desirable as a place to live, particularly among people who view network connectivity as an essential utility – not unlike water and electricity.

Several cities are already paving the road – Philadelphia, PA; Dayton, OH; Grand Haven, MI; Hermosa Beach, CA; and Atlanta, GA, are pursuing pilot programs around wireless capabilities or initiatives to provide wireless access to public employees as well as citizens.

As other cities and counties explore the possibility of rolling out wireless broadband projects, the first question to ask is, “Why wireless?” The

² Whatis.com, Tetra, <http://www.tetramou.com/facts/index.asp?setsub=0>.

³ Webopedia, VPN, <http://www.webopedia.com/TERM/V/VPN.html>.

⁴ Senator Patrick Leahy, Senate Web site, <http://leahy.senate.gov/vermont/cyberselling/glossary.html#title>.

⁵ Webopedia, WiMAX, http://www.webopedia.com/TERM/8/802_16.html.

⁶ Roadtrip America, Glossary, <http://www.roadtripamerica.com/dashboarding/glossary.htm>.

⁷ Wordreference.com, Wireless Local Area Network, <http://www.wordreference.com/definition/wireless+local+area+network>.

⁸ IT Facts (http://www.itfacts.biz/index.php?id=C0_19_1).

answer is simple economics. Many jurisdictions launch wireless broadband out of an economic interest in leveraging existing infrastructure or improving network capabilities.

The ROI of wireless broadband goes beyond dollars invested in equipment to the qualitative benefits gained by field and mobile workers and access to government information and networks that was previously unavailable. According to Dianah Neff, chief information officer for the City of Philadelphia, which is undertaking a major wireless initiative, "One of the reasons and justifications for doing a wireless program is because it can improve efficiency by reducing the number of projects that are underway if staff can stay in the field without having to return to the office or yard."

The increased capacity of the wireless initiative positions the city well to modernize the way it approaches some of its core responsibilities. For example, Philadelphia will have to reevaluate all 600,000 land parcels within its boundaries by 2007. "We can either do that by bringing in a whole lot of assessors or we can use technology. We believe wireless is the way to go," says Neff.

A wireless application used by the assessors will allow the city to have geographic information in the field. As a result, Neff and her team are looking to use high-speed broadband access at affordable rates for assessors, building and health inspectors, social workers, and more. The city expects significant cost savings by acting as the anchor tenant on the solutions.

In an interview with the Center for Digital Government about WirelessPhiladelphia, as the initiative is known, Neff says she believes the Web is to the Internet what Philadelphia's metropolitan wireless network will be to the city's operational environment. "We had [ARPANET, the earlier version of the Internet] around for many, many years. But it took an affordable, end-user tool to explode it. And the Internet has changed our lives in everything we do," she says. "I believe Wi-Fi has that same

WIRELESS TECHNOLOGIES: CHOICES FOR LOCAL GOVERNMENT

The term "wireless" describes an essential part of the network infrastructure and is sometimes used to describe different things. To help clarify any confusion over word usage, it is useful to begin with definitions of common terms in the wireless discussion.

Wireless Fidelity Technologies: Wi-Fi technologies are based on IEEE 802.11™ standards and are commonly found in public outlets, such as coffee shops, airports, hotels, campgrounds, etc.), which are known as "hot spots" (see Key Definitions, p. 6).

Wi-Fi offers untethered broadband access to users with laptop or handheld computers. Wi-Fi operates in unlicensed 2.4 GHz and 5.2 GHz spectrums, meaning that Wi-Fi providers and end users do not require an FCC license. Governments can manage and control the networks, and the networks can go up to 54 megabits per second on a 20MHz channel. The typical outdoor ranges for standard Wi-Fi equipment are on the order of several hundred feet.

Broadband-over Power Lines (BPL): BPL services delivered through utility companies' power lines enable service delivery without having to install infrastructure – including cable and fiber – or absorb the associated costs. For example, Idaho Power Company is examining the use of its outlets to deliver broadband capabilities. Issues have yet to be resolved, and it will take an investment to make it a reality. BPL can be attractive to municipalities since it uses power lines as the data transport mechanism, which already are present throughout communities. BPL can provide a convenient transport mechanism for wirelessly-enabled homeland security applications, such as video surveillance, environmental sensors and intelligent traffic systems.

Voice-over Internet Protocol (VoIP) Wireless-over Wi-Fi: This involves the delivery of voice information in the language of the Internet, i.e., as digital packets instead of the current circuit protocols of the copper-based phone networks. In VoIP systems, analog voice messages are digitized and transmitted as a stream of data (not sound) packets that are reassembled and converted back into a voice signal at their destination. The overarching idea is that VoIP allows telephony users to bypass long-distance carrier charges by transporting those data packets just like other Internet information. With VoIP, your PC becomes your phone and you can call anywhere in the world for the cost of a local call.⁹ This technology enables voice communications over Wi-Fi networks. It requires additional network engineering compared to Wi-Fi networks designed for Internet access to ensure adequate voice quality. Using VoIP technology, employees could carry a portable device (BlackBerry, PDA, etc.) and use Internet Protocol (IP) for voice and data communications.¹⁰

⁹ Changewave.com, Glossary, VOIP, <http://www.changewave.com/Glossary.html#V>.

¹⁰ Compiled with the assistance of Rizwan Khaliq, global business development leader for IBM Wireless Broadband & Sensing Solutions.

transformational capability. It will provide an easier, low-cost entry for small- and mid-sized businesses."

"Right now, it is not affordable for that segment of our population at \$800 to \$1,500 a month for a T1 line or residents to pay \$40-\$55 per month for broadband access to the Internet. We believe that there must be access for the disadvantaged individuals and small businesses in helping us eliminate the digital divide," she adds. With public policy, business and social objectives clearly defined, the city sought out a private partner to build out the wireless infrastructure to make WirelessPhiladelphia real.

While the potential dollar savings and overall ROI sound attractive, there are still some city officials who express concerns over security, which might be compared to the same issues raised in the early days of the Internet when users had attention on privacy, acceptable use and security related to financial information and more.

Today, concerns over wireless security are being addressed by using a standard suite of tools for authentication and access controls, which give authorized users access to the network and the applications that ride on them while keeping unauthorized unwanted users out. Tried-and-true encryption technologies have been augmented with an encryption protocol engineered for the wireless world. Wired equivalency protection protects the integrity of information...by coding and decoding wireless data traffic in ways that only authorized users can see it and use it. Beyond that, virtual private networks, which allow organizations to securely connect remote offices or wireless connections using the public Internet, are another option.¹¹

Satisfying concerns about security and capacity are essential to answering the question of whether to pursue a civic wireless initiative. As the discussion moves from "whether" to "how," local governments have at least two choices in approach, each of which come with

some critical decision points. Each will be discussed in turn.

- The Incremental Approach: It implements limited wireless networks that can be accessed by internal government employees.
- The "Enterprise-at Once" Approach: This enterprise-wide approach creates an entire wireless city infrastructure that allows both employees and citizens to have access to the wireless broadband network.

The How: The Incremental Approach

Many cities choose an incremental approach to building a wireless broadband network and make smaller investments by deploying the network as a small community wireless broadband network, division-only project or pilot or, as Robert Taylor, chief information officer for Fulton County, GA, says, "We started from the very beginning laying down various technology pieces relative to [wireless] as an enterprise solution. And we've tried to stay one step ahead of our user community in laying these out."

City of Detroit: The City of Detroit, MI, launched a small community wireless broadband network in its downtown area where access is provided in parts: down one of the city's main streets where the buildings are wirelessly connected and through three parks (one at each end and one in the middle). Next, the city will extend the wireless broadband network into the Eastern Market (that is, the Farmer's Market on the city's east side), a busy marketplace where citizens will be able to use the wireless network to log onto the Internet for free.

Another significant incremental approach for local government is to launch wireless in the public-safety sector (sheriffs, police and fire). Before Wi-Fi (see Key Definitions, p. 6) became prevalent, police and fire departments used wireless radios and communication devices to report back during emergencies. Today, wireless

networks have expanded capabilities to include access and secure transmission of files, reports, digital images, and more.

Orange County: Orange County, CA, is still in the infancy of its wireless deployment, having built a wireless network for its police and sheriff's departments where it uses limited, basic communication technology, 19.2Kbps, multi-modem cable, DSL, and wireless modems and radio technology in its police cars.

City of Tempe: The City of Tempe, AZ, is working on a wireless initiative, but has already deployed a wireless network to its police department where officers have laptop computers with wireless antennas built into them. They can upload law enforcement data right from their vehicle-mounted laptop or take it out into the field, take and upload reports to the virtual private network, pull down photos of mug shots or fingerprints, and more.

Johnson County: Johnson County, NC, has also created a Wi-Fi presence in its county and 22 cities within the county. Law enforcement was one of its key beginning implementation points. It has an 800MHz system used by public safety agencies in the cities and county. It works on a trunked,¹² shared network, with 3,600 radios attached and hot spots in some areas where its sheriff's officers upload and download data, and send and receive e-mail.

New York City: New York, NY is in the midst of undertaking several wireless public-safety projects. It is in the process of reviewing responses to a request for proposal to implement a citywide wireless broadband network for public safety. The pilot phase of this initiative will take place in calendar year 2005. In the pilots, technical staff will test and evaluate alternative solutions intended to support the high-speed transmission of large data files to first responders; automatic vehicle location; wireless 911 call boxes; and wireless traffic control.

¹¹ Richard Johnson, *Attack Prevention: The Security Risks and Ways to Decrease Vulnerabilities in a 802.11b Wireless Environment*, AP Attack Prevention, 2003.

¹² In telecommunications, a trunk is a single transmission channel between two points that are switching centers or nodes, or both.

Other cities and counties have expanded incremental implementations beyond law enforcement and into some common IT, administrative and general services areas.

For example, Orange County launched a small proof-of-concept wireless network project in its IT and administrative areas. The project was set up to validate security and establish standards. During the initial project phases, county technical staff reviewed several different platforms, examined specifications, price performance, etc. It published standards and began using specific enterprise-class products. It set up a wireless management engine that works with core switches and allows users – as access points proliferate in the hundreds and beyond – to have central administration, third-generation types of radios, rogue detection, site-survey capabilities, and more.

Orange County also launched a limited use of about 300 BlackBerry devices that it integrates with the county's e-mail system to deliver information to field workers and others, for example

In Fulton County, GA, officials have set their sights on developing wireless applications for the courts, and are working on a wireless system to be used for the jury waiting room. Taylor noted that hundreds of prospective jurors come into the waiting room on a regular basis. In order to provide improved service, the county intends to set up a wireless network with a special pipe out to the Internet. This would allow jurors to bring in their laptops and use the Internet while they wait.

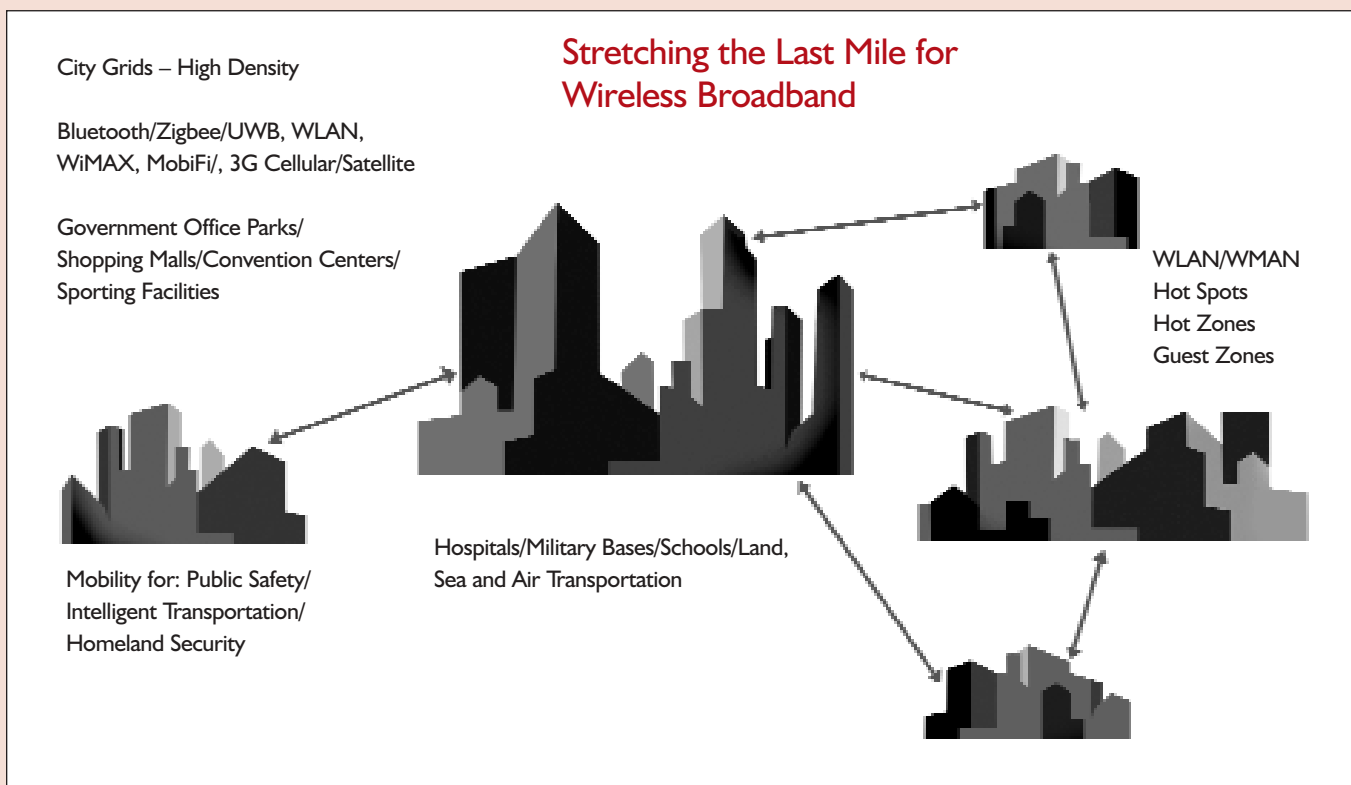
at the Health Department. The BlackBerry devices come with special screens to address the particular needs of the personnel using them.

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The “Enterprise-at-Once” Approach: The Complete Wireless City or County

The “enterprise-at-once” wireless implementation is arguably bolder and riskier, but it brings the promise of delivering benefits sooner. Under this model, a city or county can roll out an entire wireless broadband infrastructure that



is accessible both internally and externally. Many city and county executives opt for this approach not only as a means of providing ubiquitous access for internal employees, but also to help bridge the digital divide in some areas where Internet access is not readily available (for example, in rural and some urban areas).

As previously discussed, one of the premier examples of a full-scale wireless initiative underway is being taken by the City of Philadelphia, where Mayor John F. Street announced in September 2004 the appointment of the Wireless Philadelphia Executive Committee to explore the opportunity for Philadelphia to become the first large city in the United States to provide citywide wireless access.

The Committee's mission is to promote citywide connectivity; act as an advocate of wireless community networking; provide a forum for wireless networking; and formulate

recommendations in several policy areas including fees, roles and responsibilities, extent of service, privacy and security. The talents and areas of interest represented by the Committee will help identify funding sources and partnerships as part of the business plan.

In early April 2005, the mayor and city officials announced strategic plans to proceed with WirelessPhiladelphia after deciding on a business model. The city is issuing a request for proposal to build a citywide Wi-Fi/Wi-Max hybrid system. The business plan calls for citywide wireless coverage using meshed technologies coupled with Wi-Max (see Key Definitions on p. 6) for about 60 percent of the traffic with the remainder trunked through wired circuits to the Internet. The final solution will be selected through a competitive procurement process and may or may not be a Wi-Fi-mesh/Wi-Max solution, depending on the

solutions received through the request for proposal. It will cover all 135 square miles of Philadelphia, providing tiered levels of service for individuals, small- and mid-sized businesses and tourists.

Philadelphia has garnered much national attention as a proving ground for the policy and practices of public wireless infrastructures. Its pioneering ways have also been a catalyst for other jurisdictions to plan for a wireless future. Many have gone further. IT leaders from other cities – such as Detroit, MI – are already examining the potential for a full-scale rollout of wireless broadband.

PART II: The Drivers

Untethering Communities through Wireless Technologies

Many government executives view wireless broadband technology as the next step in telecommunications in terms of high-speed access to information and complex media. In some cases, wireless is growing so rapidly at the grassroots level it makes it virtually impossible for government executives to ignore.

demands. Myriad business drivers intersect to make it a top project for many city managers, mayors or CIOs. As decision makers examine justification to implement a wireless broadband technology project, many leaders consider the following key business drivers behind its deployment:

A mobile workforce is also an effective and efficient workforce – especially when the job is primarily a field job, such as police officers, health or social workers, tax assessors, building inspectors, and others.

Such is the case in Tempe, AZ, where Dave Heck, deputy manager of IT in the Department of Information Technology, noted that he sees it spreading in downtown areas.

However, the decision to deploy wireless technology is not driven exclusively by grassroots

- **Increasing Productivity through Workforce Mobility:** Providing government services where they are needed through workforce mobility.
- **Freeing Location-Bound Business:** Enhancing economic development and community competitiveness.

- **Interagency Collaboration Creates Wireless Results:** Boosting interagency collaboration by integrating existing communication systems and providing flexibility to easily connect private companies as needed.
- **Improving Citizen Service Delivery:** Increasing productivity by rerouting basic customer service to self-help channels, allowing city employees to focus on more complex issues.
- **Enhancing Public Safety:** Improving building safety by providing fire departments real-time access to applications, such as incident management reports, building plans, and hazardous material information.
- **Securing Wireless Data Transfer of Sensitive Information:** Creating enhancements to public security with rapid delivery of complex media to emergency response

teams – such as large data, video and case management files – to police and emergency personnel in the field, allowing for faster apprehension of suspects and criminals.

- **Streamlining Transportation Management:** Streamlining transportation management with sensors that enable smart monitoring of city streets and highways, alerting the right agencies to unusually heavy traffic, weather conditions or accidents.
- **Enabling Learning:** Helping institutions of higher learning attract top students. Universities and local government are creating alliances to work together to provide seamless wireless services to faculty, staff, students, and citizens.

Increasing Productivity Through Workforce Mobility

Workforce mobility is a priority business driver behind wireless broadband deployment. Cellular adoption, BlackBerry handhelds, smartphones, PDAs, wireless laptops, and tablet PCs make it possible for average workers to do their jobs quicker, better and easier. Wireless workforce mobility solutions extend the static work setting into a flexible, connected environment where employees can log in virtually anywhere, anytime.

With so many mobile solutions and devices available, individual expectations have risen and today's government personnel request the same mobility options as the private sector or even the home user. "It's a business driver," explains the City of Tempe's Heck. "If you can operate and do your business without having to be behind a desk, it's a big advantage."

Heck's view is echoed by Orange County's Webster Guillory, who says, "There's no question that among our worker forces, there are people every day wanting to have greater and greater access to conduct their business in a wireless way. They don't understand why they can't just have a laptop and tap into our computers here in the county and pick up various information they need."

A mobile workforce is also an effective and efficient workforce – especially when the job is primarily a field job, such as police officers, health or social workers, tax assessors, building inspectors, and others. With the recent increase in local government dealing with tight budgets, mobility and efficiency mean fewer resources expended and the ability to do more with less.

Increased demand for public services and declining budgets have local governments taking a hard look at the way the public's work gets done. Among the many alternatives under consideration is to place workers in the field – full time, which would essentially trade their desks and cubicles for wireless devices so they can work where and when they are needed without the need to go back to the office.

Information gathered in the field – especially for records – is likely to be more accurate and of better quality, because field workers gather and input it at the point of collection and can note the context in which it is gathered. Productivity gains are also achieved through field workers' access to their own departmental systems in real-time – and it eliminates the need for batch uploads and data conversion from printed forms, which also cuts down paper costs.

"We're definitely looking at ways to make... [Fulton] county [staff] more productive – and it's one of the driving forces behind [wireless]," explains Taylor.

It puts the field workers on the front lines where they are more productive by producing work on the spot. For example:

- Social and health workers visit homes or restaurants (respectively) and upload and download reports and information as they work with the clients.
- Police officers, working in patrol cars or walking the beat, can check criminal records, download mug shots, and upload and download reports.

- Firefighters work from fire engines or emergency sites and download building plans and check incident reports.
- Building inspectors and tax assessors visit sights, work with clients, and upload and download data, reports, graphs, photos, and more.

For cities and counties that are highly rural or with geographically dispersed workforces, wireless access creates efficiencies through eliminated commute times. The city of Tempe, AZ, cited its city's geography as having an impact on its wireless efforts. Its building inspectors, for example, can start their day out in the field and save the commute, thereby lowering traffic congestion and air pollution.

It also makes the field workers' jobs easier if they have access to their own resources. For example, a water utility worker in Tempe would be able to pull up real-time maps and information about the infrastructure for the street or run tests in the sewer system – all of which makes it more efficient for them if they can look at material, update information, and upload it while they're out in the field.

In Orange County, CA, appraisers load property information on a tablet PC before they go to the field. When they review a property, they have a photograph, property record, building diagram and other information at their fingertips. If they see anything that's different from the records, they can knock on the door to get more information. Updates are made in the field and downloaded back in the office. In the future, some parts of this process can be wireless.

Freeing Location-Bound Business: Community Competitiveness and Economic Development

Wireless capabilities make communities more competitive, and serve as the inevitable extension of the network access on which we rely. Today's citizens look at wireless capabilities and Internet access in general much the same way they might look for neighborhood parks when investing in a home. As Guillory notes,

INTERAGENCY COLLABORATION CREATES WIRELESS RESULTS

Fulton County is in the early stages of a partnership with the Georgia Department of Human Resources as well as the Centers for Disease Control (CDC) based in Atlanta. The partners worked on redoing an interoperable communications system and creating a common wireless platform relative to bioterrorism responses to an event involving a germ or gas attack.

The Department of Human Resources and the CDC established a portal to address bioterrorism-related communication strategies and Fulton County began working with them on it. They will be broadcasting and communicating out using a BlackBerry environment. In order to work with this environment, Fulton County provided a BlackBerry device to all of the senior people who are first responders (police, sheriff and fire).

They use BlackBerry devices in a wireless environment for communicating and sharing information should something like a bioterrorism event take place. The information goes from the first responders to the Department of Human Resources that in turn communicates to the CDC.

“Besides not gaining the efficiencies that wired or wireless connectivity will bring to government operations, you’re going to have a hard time seriously competing in the economic development area,” says Reid. “If you’re a community and you want to let everyone know who you are and bring money in, you better have an Internet presence – government and community.”

“Orange County has 80 percent of its citizens with access to the Internet; 50 percent of them have access to broadband.” The Orange County experience mirrors national adoption rates where landline and broadband access is concerned. It is worth noting that home Wi-Fi systems have been installed in a quarter of households headed by 18 and 44 years. Industry projections call for home Wi-Fi to grow three-fold by 2008.¹³

In the City of Detroit, community competitiveness is a primary driver behind the city’s desire to invest in wireless broadband. “You have to meet the needs of your population and today’s folks want wireless,” says Dave Rayford, chief information officer. “There is no way around wireless – it’s compelling, fast and inexpensive.”

Jack Clegg, director of information technology services in Johnson County, KS, also notes that access is important to citizens in his area as well. “Eighty-five percent of our citizens [have access to the Internet]” he says. “We have the infrastructure in place, and if you’re not connected you can go to any one of our 16 libraries ... and have unrestricted access to the world.”

According to Stan Reid, chief information officer for the Texas Association of Counties, communities can ill-afford not to have Internet access, and in a state like Texas where 80 percent of the population lives in 40 of Texas’ 254 counties, landline-based access isn’t always a viable solution – especially where those 40 populous counties take up only 15 percent of the land area of the state. It’s difficult to get high-speed Internet access to remote ranches in the state, and some towns still don’t have it

either. Wireless broadband offers a solution to get them connected to the world.

“Besides not gaining the efficiencies that wired or wireless connectivity will bring to government operations, you’re going to have a hard time seriously competing in the economic development area,” says Reid. “If you’re a community and you want to let everyone know who you are and bring money in, you better have an Internet presence – government and community.”

Wireless is the inevitable next step in terms of what citizens want as an available option to go online and do business with government. Some communities even look to it as a competitive point, as is the case in Fulton County, GA, where leaders must contend with the competing interests of neighboring counties. “We try to keep technology up to speed and stay ahead of them,” says Fulton’s Taylor.

As a result of such competing interests, some local jurisdictions take a progressive approach to community wireless implementations by adopting a “build it and they will come” approach, as was the case with Tempe, AZ, where Heck believes that people will naturally be attracted to wireless capabilities. “It is the way society is going,” he says. “We need wireless – and people may not outwardly look for it, but they will notice when it is not available.” Tempe also plans to lease its light pole infrastructure to generate revenue for the city. The revenue will go back to the provider to subsidize municipal use of the wireless network.

¹³ JupiterResearch/Ipsos-Insight Entertainment Technologies Consumer Survey (7/04).

Heck points to the popularity of wireless hot spots in coffee shops and how it revitalizes downtown neighborhoods and creates revenue-generating opportunities. He believes it will bring people back into a downtown district and, ultimately, attract more businesses that see the value of the revenue-generating potential of increased traffic through the area.

Part of Philadelphia's strategy is that ubiquitous wireless will help create new jobs and opportunities for those who do not have Internet access and large margins of disposable income.

In contrast to Philadelphia's ground-up approach to realizing economic benefit, New York City's strategy is to have an economic impact in a slightly different way. New York City recently awarded mobile telecommunications franchises to six companies to install wireless antennas, base stations and access points on designated city street light poles, traffic light poles and highway sign support poles. The installations will enhance cellular voice and data services and promote the deployment of emerging wireless technologies in the city. New York City is allowing these six companies to site their equipment on up to 18,000 pole tops. "If fully deployed, the City could receive several millions of dollars annually in franchise compensation," says New York City CIO Gino Menchini.

By allowing these antennas, New York City and the wireless companies that operate there are responding to the demand for reliable cell phone service and next-generation wireless products. Menchini believes this program will also improve wireless coverage in underserved communities while helping to keep the city on the cutting edge of wireless communications services.

Improving Citizen Service Delivery

One of the most important aspects about high-speed wireless broadband service is improved customer service through enhanced efficiency and productivity of government employees. It enables field workers to communicate faster through sending and receiving e-mail and rapidly responding to citizens without having to

return to the office and upload information. This reduces the time required to process information — be it from a social worker uploading a form to get a client signed up for public assistance to a tax assessor sending in an appraisal — from days to minutes.

It allows workers to stay in the field longer, get more done, and spend more quality time with each client without having to rush back to a desk to handwrite forms or upload them. Workers spend less time entering and processing information, and more time thinking with information, solving problems, or moving on to completely new job challenges.

With information available almost instantly for download, mobile workers with wireless access answer questions faster about things like property taxes, fees, assessments, boundary lines, etc. "Field workers are more responsive," says Clegg. "Customers can have instant gratification."

Menchini agrees and says, "We could get to the point of having our employees able to access their agency applications directly, with real-time functionality. Some of the tremendous advances in handheld devices and electronic forms technology will give us the ability to send work orders directly to employees in the field. For example, inspectors could be directed to go through a structured inspection and then print out the results."

These overall improvements can, according to Neff, drive down the costs associated with service delivery and get a better response to the public. This happens through cost reductions in areas such as fewer calls or complaints into a department. It also reduces the amount of transaction time and paper associated with forms sent through the mail or even inter-office paperwork associated with internal processes and forms.

Enhancing Public Safety

Wireless broadband technologies make communities safer places to live and work by providing two key features: real-time information and ready access to information. These

two capabilities affect all aspects of community safety and many levels of local government, from the fire to police to health services.

For example, wireless technologies allow fire fighters on the way to an emergency to download incident management reports on laptops; police officers to use BlackBerry devices or PDAs for identification of criminals through downloaded digital mug shots and apprehend criminals right at the crime scene; health workers to access the CDC's network to obtain information during a medical crisis; and more.

Public safety is further enhanced through the creation of a seamless wireless broadband network that ensures no break in communication. Some communities have created this kind of service through the application of mesh technologies where users have, for example, 16 radios on cell phone towers, buildings or streetlights in a square mile that communicate with each other. As the firefighter or police officer rides down the street, they never lose connection to the network, and they're in constant communication with the device in their vehicle and within that square mile — and there are one or two nodes connected to a fiber backbone, which is a high-speed network back to the source of the data.

For police officers that are on the frontline of securing the community, wireless broadband provides an improved resource that goes beyond voice communication. If police departments use a system that was built for voice-only, it's hard to transport data across that network, but by augmenting that network with a wireless high-speed network, police officers rapidly pull up files, photos and fingerprints. "I think it definitely increases security in the community by allowing those sort of [capabilities]," says Heck.

Emergency and public safety workers in general also realize benefits from wireless technologies. For example, one application being used by the California Highway Patrol (CHP) monitors all of the freeways and main arteries in metropolitan areas and uses icons and other non-verbal messages wirelessly sent to first responders. When the CHP responds to an

accident and determines a need for an ambulance or a police car, the system sends a message that prompts an icon to pop up on-screen at all of the local radio stations. The two-way radio system transmits alerts to tow trucks, ambulances and related services. Since the system is integrated, cell phone calls coming in and messages posted allow all users to see the most recent information. As a result, it enables the CHP to help keep the traffic moving, especially during rush hour.

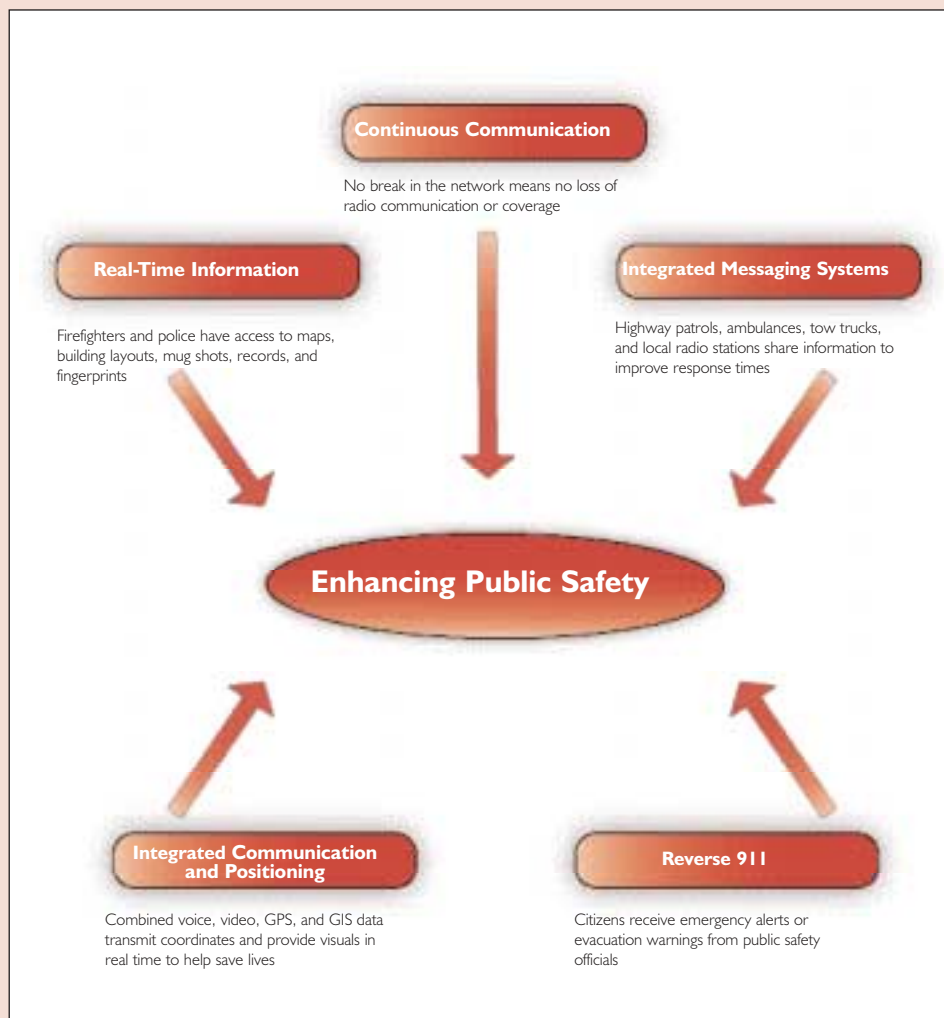
The CHP's application only touches upon the potential of wireless broadband technology's influence on law enforcement's ability to make

communities safer. According to Reid, wireless applications particularly in the area of law enforcement offer great potential to integrate communications systems with global positioning systems (GPS), geographic information systems (GIS) and wireless technologies.

Reid describes a future when an officer on the street can talk into a voice and video two-way radio on his or her lapel and pass information and video back and forth via a high-speed wireless network. The officer could send a voice and video image to his or her partner, who could see what the officer sees. The same information would transmit coordinates via

GPS back to dispatch and that information could be plugged into the GIS. The officer could also see what the dispatcher sees. It would be a robust, multimedia, wireless communication system that would help save lives.

Another enhancement to public safety could also come from reverse 9-1-1 that some government executives believe could be easily implemented on a wireless broadband network where public safety personnel could notify citizens about a traffic accident or safety incident through cell phones. Reverse 9-1-1 uses information about citizens stored in a con-



fidential database to make telephone or cellular calls to residents to alert them about an emergency or evacuation warning.

Securing Wireless Data Transfer of Sensitive Information

High-speed wireless broadband creates enhancements to public security with rapid delivery of complex media to emergency response teams – such as large data, video and case management files – to police and emergency personnel in the field, allowing for faster apprehension of suspects and criminals.

In New York City, in the post-9/11 world, an essential law enforcement and homeland security tool will be wireless access to large video and data files by law enforcement officials. This includes first responder access in the field to such things as real-time video and rapid database file transfers, including maps, building layouts, medical records, and missing person images.

Firefighters on their way to incidents would have real-time access to building plans, floor plans and layouts to help them secure and fight fires faster. A firefighter could download the information on the spot about electrical wiring, areas with potentially hazardous materials and more. They could also alert other firefighters in the building of what unsafe areas they might encounter and ways around them.

Additionally, security is further enhanced for all public safety personnel through the redundancy wireless broadband offers. Reid explains that wireless broadband augments the use of commonly used radio systems being used for homeland security. Wireless broadband offers the law enforcement community something to fall back on when radios don't work in certain urban areas. The wireless radios would be able to roll over to a five-mile radio system if the cell tower goes down, offering a reliable and improved security system for officers to protect the public during emergencies without worrying about loss of radio communication or coverage.

As many cities continue implementing these kinds of services, other advanced security options are emerging on the market to make wireless broadband technologies more attractive to city officials who haven't made that next step because of perceived security threats, the need to protect public information, and the need to adhere to state and federal compliance laws, such as Sarbanes-Oxley and Health Insurance Portability and Accountability Act (HIPAA), which are among the most relevant to the government market.

Other new technologies include a hybrid encryption standard, called over-the-air encryption. It protects over-the-air traffic by using Wi-Fi-protected access with rotating encryption keys or VPN. The resulting multiple layers of security make wireless traffic harder to penetrate by unauthorized users while allowing flexibility to customize access control for a number of different types of users and their devices. In this way, security is not simplified to the 'lowest common denominator,' but flexible policies protect at the appropriate level throughout the network.¹⁴

Streamlining Transportation Management

Intelligent transportation systems combined with wireless broadband technologies can change the way traffic is managed and controlled. Smart monitoring of city streets and highways alert the right agencies to unusually heavy traffic or accidents. Wireless broadband technologies work seamlessly with those efforts to deliver information to the right places to ensure streets stay clear and traffic moves.

New York City officials believe that smart transportation systems that leverage wireless capabilities will offer relief to traffic congestion and open up roads for emergency vehicles to pass. Transportation management systems that deliver information wirelessly to traffic controllers alleviate traffic congestion by sending up-to-date data to radio stations and alert

signs to divert traffic flows. This information also can change traffic-light patterns in front of emergency vehicles to facilitate and reduce response time.

Transportation management centers for larger metropolitan areas could leverage wireless capabilities to improve traffic flows on freeways. Orange County, CA, runs a large transportation management center, as does Los Angeles County. These centers use street sensors to monitor how traffic is flowing on every freeway in Southern California and on the many arteries that run next to the freeway. The wireless feeds are aggregated and distributed to assist traffic flow – from traffic management and emergency response to commuter information delivered directly through the network or indirectly through area broadcasters.

Additionally, Southern California freeways use remotely-operated cameras. Traffic managers queue up a camera and turn it on a traffic situation. In all of the traffic centers, they see firsthand what is going on in the traffic area.

Similarly, Cobb County, GA, has a synchronized traffic-light system that is managed in a wireless environment. Vehicles going at a certain speed are able to travel non-stop, hitting no red lights. It allows travelers to go on their journeys at a quicker pace and avoid sitting in traffic.

Another way wireless broadband technologies could have a positive impact would be through public transportation. In Philadelphia, light-rail systems and buses move a lot of people from destination to destination. The city is working with its transportation authority in southeast Pennsylvania to examine installing wireless capabilities on rail lines. This would enable commuters to be more productive and work on wireless-enabled laptops to log onto the Internet and conduct business while they wait at the train or bus stations. Wireless could also be used to monitor buses and trains, show locations or register delays.

¹⁴ "What is the Next Wireless Security Surprise?" The Wireless Wizards, *NetworkWorldFusion* (<http://www.nwfusion.com/columnists/2004/>).

Enabling Education

Wireless broadband technologies have gained a stronghold in many universities across the nation, including Indiana University, California State University and Iowa State University. Wireless capabilities attract students much like a campus location, academic ratings or honored faculty or staff. Today's student expects to log onto the Internet from his or her dorm room, cafeteria, student lounge, classrooms, and other open-air spaces and facilities.

The opportunities for local government to leverage the wireless campus are significant. The City of Tempe has been collaborating with Arizona State University (ASU) to develop a sharable high-speed Internet service provider. As the campus moved more buildings out into the community, officials at ASU asked the city if there was any fiber in the area it could use. As a result, the campus and the community began sharing infrastructure.

As the city began exploring wireless opportunities, the natural collaboration that already existed made ASU the perfect partner to explore what wireless opportunities could be beneficial to both enterprises. Project leaders are examining other wireless models and have already worked with ASU on a free wireless zone in its downtown area that ASU borders. Tempe has been working with ASU to install this network, utilizing Tempe's spare fiber, infrastructure and public and university buildings. ASU provided the hardware and bandwidth for the delivery to the Internet or access points back to campus.

The City of Philadelphia is also examining the campus-as-ISP model as part of its wireless broadband initiative. Since individuals cannot walk onto local college campuses and instantly access the wireless network without being a sanctioned user, the local colleges (there are 300,000 college students in the greater Philadelphia area) are considering becoming ISPs that would give users roaming capabilities. The campuses would be the actual service provider to these groups of people.

In Philadelphia, light-rail systems and buses move a lot of people from destination to destination. The city is working with its transportation authority in southeast Pennsylvania to examine installing wireless capabilities on rail lines.

University or college partnerships with local government can also play an instrumental role in extending education to rural or remote areas where no service or only dial-up access exists, thereby helping to bridge the digital divide. Wireless broadband would make it possible to create a broader distance-learning network that could provide access to these underserved regions and areas as well as broadband capabilities that would make it possible to upload and download complex media files.

Part III: The Decision Points

Choices for Champions of the Untethered Nation

Every IT project, big or small, costly or inexpensive, needs an executive champion, sponsor or evangelist to spread the word about its value, benefits and advantages – and broadband wireless projects are no different. The champion, just as the word implies, is the leader who gets behind the project and persuades others that her cause is worthy, valuable, cost-effective, and efficient.

Every champion also needs a roadmap and a direction to follow – especially if she is going to successfully persuade both internal and external stakeholders that her wireless plan is the best choice. To be successful, the champion must confront at least five key decision points:

Decision Point One: Who? What kind of leaders from other areas of local government should be recruited? What kind of characteristics should they possess that would help with major issues, such as mobilization, implementation, change management, and evaluation?

Decision Point Two: What? What kind of wireless broadband technologies should be used? What are the considerations about security and data exchanges? What should be done to integrate wireless into enterprise architecture, with particular attention to network and computer security design? What kind of physical and logical access controls needs to be established? Are there any public disclosure and compliance requirements?

Decision Point Three: Where? How far should the wireless network stretch – business districts? Campuses? Public places? Suburban and rural communities?

Decision Point Four: When? Considering community readiness and anticipating WiMAX

The champion will force non-trivial challenges to move the mass of stakeholders toward wireless, to change business requirements and processes, and to do all of the necessary tasks inherent in any enterprisewide project. An uncommitted leader will likely end up with a small, division-only wireless broadband project with limited functionality and capabilities and little impact on the overall business of government.

(which provides high-speed wireless access in a 30-mile radius) and the innovation behind it, how prepared does the local government and the community need to be?

Decision Point Five: How? Build or buy? Should government own its wireless infrastructure or be its anchor tenant?

Decision Point One: Who? Leadership

In order for the wireless champion to make key decisions, he must first identify his commitment to wireless broadband. The importance of this level of commitment and enthusiasm relates to the idea that broadband wireless – in order to work at its best – needs to be implemented across the enterprise and possibly across jurisdictional borders.

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The Philadelphia model demonstrates the value of having Mayor Street actively champion WirelessPhiladelphia with CIO Neff on point for making it real (from initiation and collaborative planning with the full range of stakeholders to procurement and implementation), moving the project forward with a common message based on a shared vision and supported by the level of executive support needed to see through such an ambitious project.

A wireless broadband champion needs to be what one CIO describes as a “super project manager,” a person who supports his executives, governing boards and city council people, and understands the value of partnership.

The wireless project champion understands the value of communication and bringing all of the stakeholders together to meet, discuss it and form a plan. The champion needs to be the leader among organizations and understand a wireless initiative cannot be done in a vacuum – there are too many players and too much investment, time and energy at risk. “You have to be the coach, team player and cheerleader – and you have

Many jurisdictions use traditional encryption standards to address the need for secure outbound communication. The City of Tempe relies on encryption for wireless transport and anything going out of the Internet and through firewalls. The city has intrusion detection on all systems, so users can access data from the outside. IT workers also do virus checking on the inside and apply a combination of tactics to manage wireless security efforts.

to get people together who historically don't want to play together," adds Johnson County's Clegg.

Decision Point Two: What? Robust, Secure and Untethered Data Exchanges

What kind of wireless broadband technologies should be used when there are so many choices and industry names – Wi-Fi, WiMAX, WLAN, etc.? How do local government decision makers distinguish between all of the different wireless broadband technologies to conclude which one works best for their jurisdictions?

The main way to ferret out the choices is to take a strategic approach and not drill down to the specific functionality and features. Industry analysts suggest that a wireless broadband solution offers a dynamic, flexible non-static environment that extends government borders and reaches to the furthest mile of the city, county or both.

The vendor partner that provides the service should be a full partner who doesn't distribute out-of-the-box solutions, and then walk away. The vendor partner works with local government to consult and help lead the effort to create a wireless broadband network that integrates into the enterprise architecture to work throughout all of the government buildings; and it interoperates with the converged network, which is important because most desktops are still hardwired. Detroit's Rayford notes the importance of integrating with the

enterprise architecture, because "at some point things have to hit the ground and go through some wires."

Attention should be given to computer security design and management of outbound data that prevents penetration of malicious data. Creation of effective security means building on today's IT standards and avoiding reengineering everything from scratch. Since it's nearly impossible to provide point-to-point data transport, the wireless broadband network needs security created with multiple tiers on it, which requires collaboration for all local partners. The wireless authentication model uses both conventional and network authentication.

Solid security design allows personnel who use it to not deal with technical difficulties that would force users to go into sub-nets and have to change Internet Protocol (IP) addresses. A good security design allows users to roam freely – and all of that should be considered before implementation.

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Security policies must also be established to address how the local jurisdictions handle the network when a wireless device is lost or stolen so that the entire network is not forced to shut down. These kinds of security-related small details should be addressed in the request for proposal.

Local government also needs to put security systems in place to protect information as it flows over wireless broadband networks in order to comply with rules and regulations created by federal laws, such as HIPAA. These compliance requirements put certain restrictions on how records and data are shared and used – and wireless communications fall under federal, state and local requirements, rules and restrictions.

Decision Point Three: Where? How Far to Stretch the Last Mile

The ideal wireless broadband network would be completely seamless offering broad access where no boundaries are identified and users move from place to place, city to city, or county to county and can log on. While the City of Philadelphia is attempting to create an environment with near-ubiquitous access, it is so far the exception rather than the rule. Debate still exists among industry analysts about the technology, investment and resources available to create this kind of model.

In the meantime, many cities and counties will attempt to build various versions of the Philadelphia initiative, and government executives will be asking themselves, "How far should my wireless broadband network stretch?"

Tempe's Heck answers that question by saying, "It should go as far as we can take it into the public buildings, schools, inner-business districts, parks, and any public building – even retail if it's an area that has a high density of public and open-market space."

While this sounds like the right approach, many local jurisdictions by nature of geography and expanse of land have significant challenges to overcome if they decide to build this kind of

The wireless authentication model uses both conventional and network authentication.

wireless broadband network. For example, Fulton County's Taylor expresses great interest in this kind of wireless service, but also realizes the inherent challenges in building one in a county of 600 square miles. "I would like to [have my inspectors] go anywhere out there, go to any house, inspect it using wireless access and everything is covered, but it's not that way," he says.

Johnson County faces a similar situation in terms of a rapidly growing citizen population that is increasing at a rate of 12,000 people per year. Clegg realizes that countywide coverage will offer significant difficulties, so he has instead decided to focus on key locations such as the county's upper-third portion where the population is denser and where complete coverage would be most effective.

Decision Point Four: When? Considering Community Readiness

It is one thing to blaze a trail in front of other local governments and create an exciting, new wireless broadband network, but it's another thing to do it and not have the workforce prepared with the right wireless devices or a citizenry that still thinks it's novel to have hardwired Internet access.

Government executives need to look beyond internal preparations for a wireless broadband initiative and look to the community. Is the community ready for a wireless initiative? And if not, what would it take to get it ready?

First, local government officials might examine how Internet-connected are regional businesses and citizens. In some places, 85 percent of the citizenry are connected and nearly all of the businesses. Would a county with this kind of Internet penetration be ready for wireless? In all likelihood, yes, if you think about it the way some government executives do.

FORMING PARTNERSHIPS WITH YOUR NEIGHBORS AND SUPPLIERS

Public government and private partnerships create a seamless wireless broadband network where there are virtually no interruptions in service. In order to accomplish this goal, bordering governments and organizations (school districts, universities, community colleges, etc.) are required to come together, negotiate agreements and roles, conduct strategic planning, and mobilize, implement, launch, and evaluate the project's success.

A key factor for executives as they begin discussions with neighbors is to understand each has restrictions and processes that are uniquely their own. It will take time to go through the process and develop good communication with government partners to gain acceptance and buy-in. As is true of most enterprisewide IT projects, a wireless broadband project shared across boundaries means:

- Breaking down department agency silos;
- Gaining buy-in, building new systems;
- Changing businesses processes; and,
- Training staff.

And all of this is done across multiple enterprises within even the most federated government environments.

The other critical partner in this undertaking involves the vendor partner – and finding just the right vendor that understands the needs of local government. As one

executive notes, the vendor relationship is as important as any other, because it can take the burden off cities and counties when it comes to the details of the job.

It's also important to develop business requirements during the pre-engagement phase when vendors are responding to requests for proposals. During this phase, vendors who wish to play a true partnership role should do more than come in to discuss the solution. Many government executives want vendor partners who present solutions, plans, technical and project management strategies, equitable prices, etc.

For example, Fulton County's Taylor believes the demand exists for wireless broadband services because of the kind of e-mail government workers receive. The county is rated one of the top technological counties in the nation, but its citizens often question how such a rating can be achieved if certain capabilities don't exist. Taylor believes that in his county's case it's a matter of catching up with that demand.

In Philadelphia, the intent of the wireless initiative is to bring the un-wired population into the fold and provide opportunities to have Internet access where none existed before. So, for cities and counties where Internet access is more difficult (e.g., Alaska), it isn't a question of asking whether or not the community is ready, but about giving it something that it could not otherwise have.

FUNDING MODELS FOR WIRELESS BROADBAND INITIATIVES

The truth is that very few government executives presented with the opportunity to improve services, create efficiencies, and realize either direct or indirect ROI will intentionally look away from an attractive project, such as wireless broadband; however, the reality of most fiscal environments today requires government to wring out every last opportunity from taxpayer dollars. So, what do mayors, city managers, CIOs, and others do to fund a project as large as wireless broadband?

Following are funding models that appear to have applicability for wireless deployments:

An Extension of the Emergency Preparedness Model: Grant funding to local jurisdictions from the federal Department of Homeland Security is being distributed to first responders in local jurisdictions. Funds can be used for technologies that improve security — and wireless broadband offers extensive benefits that provide for seamless communications and other capabilities during an emergency or HAZMAT situation. For more information on federally sponsored grants, visit the Grants.Gov Web site (www.grants.gov).

Bonds or City Measures: Some state and local governments use public bonds or city measures to support IT projects. For example, California passes bonds to support technology and has done so in the area of telecommunications and networking for its California State University system. Bonds or city measures can be voted upon by citizens, who will benefit from wireless broadband technologies, to fund projects similar to Philadelphia's wireless initiative.

Leasing Agreements: Local governments that decide not to own the wireless broadband network can lease right of way to the Internet service provider and trade lease payments for service. This eliminates the need to move money around. The City of Tempe intends to use this model.

Advertisements: Services can be traded for advertisements in downtown districts and revenues generated to support the network.

Public-Private Partnerships: Trading wireless services for rights of way for other telecommunications providers, cable companies and others.

Public Partnerships: Counties and cities collaborate and combine resources to build a single, seamless network that crosses jurisdictional lines.

Decision Point Five: How? Build or Buy

Should a local government own its wireless broadband services or be its anchor tenant on a network that is owned, managed and operated by a wireless broadband service provider? That answer depends on the local government's size, technology expertise and expectations.

Local government executives are divided on whether government should be in the business of providing telecommunications. Some analysts suggest that governments aren't as adept at providing telecommunications as private companies and Internet service providers that have a vested interest and more reason to make it work. They argue that government should own its own infrastructure and invest in support, maintenance, operation, and general overhead investments. More to the point, in some prominent cases, is the complaint that government is competing with the private sector in an area that is outside of government's core competence. For their part, governments that have chosen to act as a catalyst for infrastructure contend they have done so because of a market failure. That is, government got into the business because the private sector was unable or unwilling to make the needed investment without incentives or external drivers.

On the other hand, an example such as WirelessPhiladelphia represents a nascent working model for government partnerships with the private sector to deliver better, timelier and more responsive wireless broadband to citizens.

Some of the initial response to Philadelphia's wireless initiative demonstrates that citizens are interested in government getting into this business. For example, "to test out how interested the community would be, [Philadelphia] created a Wi-Fi hot spot in [its] downtown at the JFK Plaza called Love Park... [It] expanded that up Ben Franklin Parkway for about two-and-a-half miles using the same access point. It is a heavily used corridor for events and citizens... In just the two-and-a-half months that we have had our Wi-Fi hot spot, we've had 1,200 unique subscribers come and actually register to use the free wireless service in Love Park."¹⁵

¹⁵ Center for Digital Government, Executive Teleconference with CIO Dianah Neff, Oct. 2004, *Navigator Teleconference Summaries* (<http://www.centerdigitalgov.com/cdg/?pg=story&docid=040929-91628>).

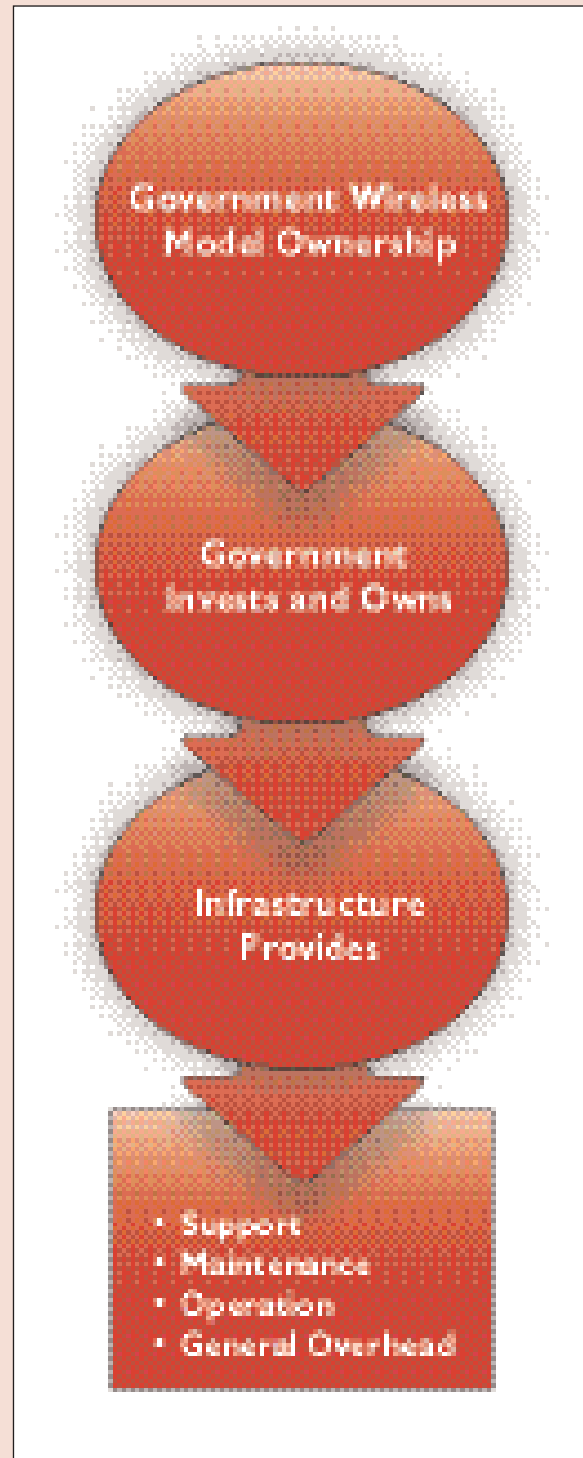
Another partnership model might work similarly to cable companies. Some counties have negotiated deals with cable companies where the companies have been permitted to run cable at no cost through rights of way. In return, the cable company agrees to give the city or county fiber connectivity.

Taken together, the civic wireless initiatives demonstrate that the deployment of diverse wireless strategies will result in improved effectiveness of government operations and as a result better services to citizens.

A leasing model where governments become renters on the network offers a cost-effective alternative to ownership. In this model, governments don't create wireless broadband services, but instead rent by the unit at, say, \$100 a month and the price is negotiated to remain stable.

Another partnership model might work similarly to cable companies. Some counties have negotiated deals with cable companies where the companies have been permitted to run cable at no cost through rights of way. In return, the cable company agrees to give the city or county fiber connectivity. This enables the local jurisdiction to have strands of fiber across major regions of the city or county and hook together government centers.

The opposite perspective to leasing or partnerships would have local government own or/and manage its own wireless broadband network out of security-related concerns for police, fire and public-safety networks, which local government has responsibility for running. Local governments that choose to run networks through private organizations have no way to ensure redundancy and security to safeguard the data, which is an unacceptable situation when the public's security is at risk.



CONCLUSION

Investment in civic wireless broadband is growing because of demonstrable benefits in service delivery and government operations, not to mention the social impacts on community and economic development. Wireless broadband is the inevitable extension of existing hardwired networks – which extends their value and adds new capacity for doing the public's business and for doing it more efficiently and in real-time and on-site. Untethering government workers, government business partners and citizens they serve is the natural next step in a societal change in which wireless devices become ubiquitous accessories that integrate into the way people work, live, play, and raise families.

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